REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a full and complete response to the Office Action dated December 31, 2007. In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

Claims 1-20 stand for consideration in this application. Claims 1, 3, 8 and 18 are being amended to more particularly point out and distinctly claim the subject invention. All the amendments to the claims and the drawings are supported by the specification. Applicants hereby submit that no new matter is being introduced into the application through the submission of this response.

Formality Rejection

Claims 8 and 18 were objected to for informalities. As the claims are being amended as required by the Examiner, the withdrawal of the outstanding informality rejection is in order, and is therefore respectfully solicited.

Prior Art Rejections

Claims 1-12, 14 and 16-20 were rejected under 35 U.S.C. §103 (a) as being unpatentable over Miki et la. (US 2007/0110060) in view of newly cited Oguchi et al. (US 2002/00067725), and claims 13 and 15 were rejected further in view of Foralow (US 2002/0133534). These rejections have been carefully considered, but are most respectfully traversed.

An access router 500 of the present invention (for example, Embodiment 1 depicted in Fig. 2-6), as now recited in claim 1, comprises: a controller which triggers an L2TP Network Server (LNS) (1821 in Fig. 4, p.3, line 15) function of terminating a plurality of L2TP tunnels or an L2TP Access Concentrator (LAC) (1811 in Fig. 4; p. 3, lines 3-4) function of initiating a plurality of L2TP tunnels for a plurality of virtual routers (e.g., VR1-VR3 in Fig, 3; p. 15, last paragraph) accommodated therein ("*the LAC function is a function to form a L2TP tunnel in a L2TP transfer network, the LNS function is a function to terminate the L2TP tunnel formed by the LAC*" p. 9, lines 13-16) and utilizes a routing information table (e.g., Fig.

8A) to support each one of the virtual routers to perform routing actions ***independently*** from other virtual routers (p. 10, last paragraph); a plurality of communication I/Fs 511-514 in Fig. 2 to transmit and receive packets to and from external communication lines; a plurality of first logical interfaces multiplexed to handle a plurality of protocols on the communication I/Fs respectively (p. 15, lines 12-24; e.g., "*ATM PVC, IEEE802.1Q TAG VLAN, MPLS label routing*"; see the logical I/F table Fig. 5A) so as to transmit and receive packets to and from user terminals according to a respective protocol (e.g., Logical I/F PVC_11 corresponds to PPPoE protocol and implemented on Physical I/F ATM_11 to perform a packet procession of Decap_PPPoE via the virtual router VR_0 as shown in 1sr row of Fig. %A); a plurality of second logical interfaces multiplexed to handle a plurality of protocols on the communication I/Fs respectively so as to transmit and receive packets to and from backbone networks according to a respective protocol and per packer procession action (e.g., Decap_PPPoE, Map_L2TP, etc.); and a memory 520/542 stored with the routing information table 545 (Fig, 8A; p. 24, last paragraph) of the plurality of virtual routers which includes a plurality of individual routing tables (VR_0: entries 2122-2123, 21340-2137; VR_1: entries 2124-2127, 2133) each corresponding to one of the virtual routers and associating a respective virtual router (e.g., VR-0) to one of the communication I/Fs (e.g., ATM_11 in entry 2121) as an input I/F, one of the communication I/Fs (e.g., ATM_11 in entry 2137) as an output I/F, one of the first logical interfaces, and one of the second logical interfaces per packer procession action (e.g., Decap_PPPoE, Map_L2TP, etc.). Packets received from the first logical interface are forwarded to one of the second logical interfaces associated with a respective virtual router according to the routing information table corresponding to the respective virtual router associated with the first logical interface, and the packets are processed according to a respective protocol and per packet processing action according to the respective routing table of the respective virtual router.

The invention recited in Claim 8 is directed to an access router similar to the one recited in claim 1 by reciting a processor which executes predetermined processing on packets transmitted and received through a user terminal, and utilizes an interface table 545 (Fig, 8A) and to support each of a plurality of virtual routers accommodated therein to perform routing actions independently from other virtual routers. In addition claim 8 recite a respective L2TP tunnel. The invention recited in Claim 18 is directed to a business method implemented via the access router of claim 8.

Claim 6 recites a table 546 (Fig. 8A; p. 25, 2nd paragraph) includes a virtual router field 2111 for storing virtual router identifiers (e.g., VR_1), a destination IP address field

2112 for storing destination IP addresses (e.g., 192.168.20.1) of received packets, an address mask field 2113 for storing an address mask (e.g., 255.255.255.0), a self-address field 2114 for storing an identifier (e.g., "0") indicating whether a packet to be processed is a self-addressed packet or not, a next hop address field 2115 for storing an address (e.g., 192.168.10.2) of a next hop node, a physical I/F field 2116 for storing physical I/F identifiers (e.g., Ether_12), and a logical I/F field 2117 for storing logical I/F identifiers (e.g., UDOP_1701).

"*All function units except for the physical I/F processing unit 520 and SW unit 530 must be able to operate independently for each virtual router. Independent operation for each virtual router may be realized by a plurality of methods. For example, it may involves mounting the same number of independently operating processors as that of the virtual routers; using a common processor but running the same number of independent processes as that of the virtual router; or using a common processor and a common process but employing internal virtual router identifiers. In this configuration the method using the virtual router identifiers will be explained. In this case, mapping to virtual routers can be realized by marking individual packets with virtual router identifiers* (p. 10, last paragraph)".

L2TP transfer networks 651-653 are built independently of each other without having to be aware of the presence of one another. Since L2TP transfer networks need only be a simple IP network, a new service of "relaying L2TP tunnels", nonexistent so far and different from the access line providing service or ISP service of the prior art, can be set up. As such, an access line provider can connect to a plurality of relay carriers' networks 651-653 by using a single access router 500 (p. 16, 2nd paragraph). Other advantages of the present invention include (p. 20-21): The access router holds a plurality of routing information, the connection with a plurality of independent IP networks is made easy. The invention assigns the management authority over a LAC device to an access line provider/communication carrier for each virtual router realized in the access router, such that the access line provider may wholesale (transfer or assign the management authority over) any or all of the functions (claim 18). There is no need to ground different LAC routers for different service categories and only one access router of the present invention needs to be grounded. Since individual virtual routers cooperate with different authentication, authorization, and accounting (AAA) servers respectively, the sessions accommodated in the entire device can be distributed to virtual routers.

Applicants respectfully contend that none of the cited prior art references teaches or suggests such "first/second ***logical interfaces*** multiplexed to handle a plurality of protocols

on the communication I/Fs respectively so as to transmit and receive packets to and from user terminals/backbone networks according to a respective protocol and per packer procession action (e.g., Decap_PPPoE, Map_L2TP, etc.)," or "a memory 520/542 stored with the ***routing information table*** 545 (Fig. 8A) of the plurality of virtual routers which includes a plurality of individual routing tables (VR_0: entries 2122-2123, 21340-2137; VR_1: entries 2124-2127, 2133) each corresponding to one of the virtual routers and associating a respective virtual router to one of the communication I/Fs as an input I/F, one of the communication I/Fs as an output I/F, one of the first logical interfaces, and one of the second logical interfaces per packet processing action," or "a processor packets forwards a received packet from the first logical interface to one of the second logical interfaces associated with the respective virtual router according to the individual routing table corresponding to the respective virtual router associated with the first logical interface and the packets are processes the packet according to a respective protocol and per packet processing action according to the respective individual routing table of the respective virtual router" as the present invention.

Contrary to the Examiner's assertion (p. 3, 3rd & 4th bullet points of the outstanding Office Action), Miki does not disclose, in the paragraph starting from the paragraph 41, line 36, any constituent element corresponding to the "logical interfaces multiplexed to handle a plurality of protocols on the communication I/Fs respectively so as to transmit and receive packets to and from user terminals/backbone networks according to a respective protocol and per packet procession action" of the present invention. The line interface port of Miki merely corresponds to the external communication line of the present invention.

Miki neither discloses, in the paragraph starting from the paragraph 41, line 40 as asserted by the Examiner (p. 3, last bullet point of the outstanding Office Action), any constituent element corresponding to the "virtual router" of the present invention. The control unit of Miki does not "forward from an receiving logical interface to another interface associated with a respective virtual router and process a received packet according to a respective protocol and per packet processing action according to a respective individual routing table of the respective virtual router" as the processor of the present invention.

Miki (Fig. 3) merely discloses a single virtual router and a routing table (Fig. 3) of the single virtual router, but not "a plurality of virtual routers" or "a routing information table 545 (Fig, 8A; p. 24, last paragraph) of the plurality of virtual routers which includes a plurality of individual routing tables utilized to enable each one of the plurality of virtual routers performing routing actions independently" as the present invention. In addition, Miki

(Figs. 3-4) only contains information corresponding to the tunnel identifiers (e.g., TL 11, etc), but not any virtual router identifiers (e.g., VR1) as the present invention.

In another embodiment, Miki's access node AN15 (Fig. 15) merely operates as a single virtual router for virtually fulfilling the functions of a plurality of switching elements ([0054]),” rather than “a plurality of” virtual routers each performing its own functions independently according to the present invention. In addition, this embodiment of Miki does not provide any table containing a plurality of virtual router identifiers as the table of the preset invention.

Oguchi's virtual router ([0063]; [0085]) is quite different from the virtual router of the present invention, since it does not have the unique logical interface of the present invention, or the uniquely configured routing information table of the present invention. Neither do Oguchi provide such a s processor of the present invention which “forwards from an receiving logical interface to another interface associated with a respective virtual router and processes a received packet according to a respective protocol and per packet processing action according to a respective individual routing table of the respective virtual router.”

In addition, Oguchi requires a VPN-ID, which is the identification information peculiar to VPN (virtual private network), to realize its virtual router ([0017], [0063], [0085], [0187], [0193], [0200] and [0214]). The present invention does not require corresponding its implementation to a VPN and does not require information corresponding to a VPN-ID.

Foralow fails to compensate for the deficiencies of Miki and Oguchi.

Regarding Claim 6, Miki does not disclose at all any of the virtual router field, destination IP address field, address mask field, self-address field, next hop address field and physical I/F field, in any of the cited paragraphs [0042]-[0045] as asserted by the Examiner.

Regarding Claim 10, Miki does not disclose the logical interface at all in any of paragraphs [0041]-[0042]. Miki neither disclose the identifiers of Internet service providers at all in any of paragraphs [0041] and [0021]-[0025].

Regarding Claim 11, Miki does not disclose the port number at all in line 21 of paragraph [0041]. Although Miki discloses the line port in line 23 of this paragraph, this line port seems to be same as the line interface port in line 38 of this paragraph which corresponds to the external communication line of the present invention. As disclosed in the embodiment, the port number of the present invention represents the port number in the IP protocol stack.

Regarding Claim 14, Miki does not disclose the means for switching between the LAC function and the LNS function at all in lines 15 to 17 of paragraph [0040].

Regarding Claim 16, Miki does not disclose the information corresponding to the management control commands received by the communication I/Fs in Fig. 2. Further, the description in lines 2 to 5 of paragraph [0051] does not relate to the present invention at all.

Regarding Claim 17, Miki does not disclose at all any of the management command, control command and the virtual router in lines 6 to 15 of paragraph [0051].

Regarding Claim 18, Miki does not disclose at all any of the communication carrier, virtual access router, other communication carrier and virtual router in lines 21 to 25 of paragraph 41, and Miki does not disclose at all the communication carrier in paragraph 44.

Regarding claims 19-20, as mentioned, Miki does not teach the logical interface of the present invention. None of the constituent elements in paragraph [0042] of Miki correspond to the logical interface identifier and physical interface identifier of the present invention. Even if corresponding the input port and the input terminal ID in paragraph [0042] of Miki to the physical interface identifier and the logical interface identifier of the present invention, respectively, there is no reason why "*input port and input tunnel ID are two different identities*", since the basis of "the logical interface identifier is not directly related to the physical interface identifier". For example, as shown at line 113 in Fig. 3 of Miki, the input terminal identifier is TL15 at the input port 33. This means that the value TL15 of the input terminal identifier is directly related to the value 33 of the input port.

Regarding Claims 13 and 15, the Examiner asserted that Forslow discloses in paragraph [0158] that the usage of "packet's number sequence" is known. However, the "sequence" for realizing the L2TP LAC function and the LNS function means a procedure for the communication and packet generation for realizing the L2TP LAC function and the LNS function, but not related to information of "sequence number" stored into a packet. Further, the expression "to provide protection against replay attacks and long term protection" is not related to the object nor effects of the present invention.

Applicants contend that the cited references or their combinations fail to teach or suggest each and every feature of the present invention as recited in independent claims 1, 8 and 18 and their dependent claims. As such, the present invention as now claimed is distinguishable and thereby allowable over the rejections raised in the Office Action. The withdrawal of the outstanding prior art rejections is in order, and is respectfully solicited.

Conclusion

In view of all the above, Applicant respectfully submits that certain clear and distinct differences as discussed exist between the present invention as now claimed and the prior art references upon which the rejections in the Office Action rely. These differences are more than sufficient that the present invention as now claimed would not have been anticipated nor rendered obvious given the prior art. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicant's undersigned representative at the address and telephone number indicated below.

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